Contents

Volume 23 Number 1

D. P. Fyhrie and D. R. Carter	1	**Femoral head apparent density distribution predicted from bone stresses**
S. C. Cowin	11	**Deviatoric and hydrostatic mode interaction in hard and soft tissue**
M. J. Thubrikar, S. K. Roskelley and R. T. Eppink	15	**Study of stress concentration in the walls of the bovine coronary arterial branch**
E. G. Cape, A. P. Yoganathan and R. A. Levine	27	**A new theoretical model for non-invasive quantification of mitral regurgitation**
B. Diebold, A. Delouche, Ph. Dumée, J.-P. Guglielmi, Ph. Delouche and P. Péronneau	35	***In vitro* analysis of a model of intra-cardiac jet: analysis of the central core of axisymmetric jets**
A. Garg and P. S. Walker	45	**Prediction of total knee motion using a three-dimensional computer-graphics model**
M. R. Yeadon	59	**The simulation of aerial movement—I. The determination of orientation angles from film data**
M. R. Yeadon	67	**The simulation of aerial movement—II. A mathematical inertia model of the human body**
M. R. Yeadon	75	**The simulation of aerial movement—III. The determination of the angular momentum of the human body**
M. R. Yeadon, J. Atha and F. D. Hales	85	**The simulation of aerial movement—IV. A computer simulation model**
Technical Notes		
J. A. Friederich and R. A. Brand	91	**Muscle fiber architecture in the human lower limb**
A. J. van den Bogert, P. R. van Weeren and H. C. Schamhardt	97	**Correction for skin displacement errors in movement analysis of the horse**

Book Review
M. H. Pope — 103 ***Elastic Mechanisms in Animal Movement*, by R. McNeill Alexander**

Volume 23 Number 2

M. F. Bobbert and G. J. van Ingen Schenau — 105 **Isokinetic plantar flexion: experimental results and model calculations**

G. Lensel-Corbeil and F. Goubel — 121 **Series elasticity in frog sartorius muscle subjected to stretch–shortening cycles**

G. C. Scott and E. Korostoff — 127 **Oscillatory and step response electromechanical phenomena in human and bovine bone**

M. K. Kwan, W. M. Lai and V. C. Mow — 145 **A finite deformation theory for cartilage and other soft hydrated connective tissues—I. Equilibrium results**

M. G. Hoy, F. E. Zajac and M. E. Gordon — 157 **A musculoskeletal model of the human lower extremity: the effect of muscle, tendon, and moment arm on the moment–angle relationship of musculotendon actuators at the hip, knee, and ankle**

R. H. Kufahl and S. Saha — 171 **A theoretical model for stress-generated fluid flow in the canaliculi–lacunae network in bone tissue**

Technical Note
H. Reul, A. Vahlbruch, M. Giersiepen, Th. Schmitz-Rode, V. Hirtz and S. Effert — 181 **The geometry of the aortic root in health, at valve disease and after valve replacement**

Announcement — 193 **ASB call for Borelli and Young Scientist Awards nominations**

Volume 23 Number 3

T. Tamura and A. Fronek — 195 **Determination of volume of vortices in poststenotic pulsatile flow by ultrasonic Doppler power ratio and spectrum analysis**

Hsing-Wen Sung and A. P. Yoganathan — 201 **Axial flow velocity patterns in a normal human pulmonary artery model: pulsatile *in vitro* studies**

J. J. Thomsen 215 **Modelling human tibia structural vibrations**

J. G. Hay and H. Nohara 229 **Techniques used by elite long jumpers in preparation for takeoff**

R. T. Hart 241 **A theoretical study of the influence of bone maturation rate on surface remodeling predictions: idealized models**

A. de Lange, R. Huiskes and J. M. G. Kauer 259 **Measurement errors in roentgen-stereophotogrammetric joint-motion analysis**

M. T. Mai and R. L. Lieber 271 **A model of semitendinosus muscle sarcomere length, knee and hip joint interaction in the frog hindlimb**

K. S. Koutroupi and J. C. Barbenel 281 **Mechanical and failure behaviour of the stratum corneum**

Technical Note

Y. E. Kim and V. K. Goel 289 **Effect of testing mode on the biomechanical response of a spinal motion segment**

Books Received 293

Announcement 295 **Fourteenth Annual Meeting of the American Society of Biomechanics**

Volume 23 Number 4

E.-J. Richter, B. Orschall and S. A. Jovanovic 297 **Dental implant abutment resembling the two-phase tooth mobility**

K. Ono, Y. Kikuch, K. Higashi, N. Tamiya and N. Yasuoka 307 **Elastic anisotropy of bivalve hinge-ligament**

C. R. Jaslow 313 **Mechanical properties of cranial sutures**

G. Nikiforidis, A. Bezerianos, A. Dimarogonas and C. Sutherland 323 **Monitoring of fracture healing by lateral and axial vibration analysis**

A. S. Douglas, W. C. Hunter and M. D. Wiseman 331 **Inhomogeneous deformation as a source of error in strain measurements derived from implanted markers in the canine left ventricle**

M. Pousson, J. Van Hoecke and F. Goubel — 343 — **Changes in elastic characteristics of human muscle induced by eccentric exercise**

Technical Notes

S. C. Cowin and R. T. Hart — 349 — **Errors in the orientation of the principal stress axes if bone tissue is modeled as isotropic**

R. C.-K. Cheng, T. D. Brown and J. G. Andrews — 353 — **Non-uniqueness of the bicompartmental contact force solution in a lumped-parameter mathematical model of the knee**

M. S. Vrahas, R. A. Brand, T. D. Brown and J. G. Andrews — 357 — **Contribution of passive tissues to the intersegmental moments at the hip**

Abstracts — 363 — **Sixth Biannual Meeting of the European Society of Biomechanics**

Announcements — 397

Volume 23 Number 5

S. A. Marom and M. J. Linden — 399 — **Computer aided stress analysis of long bones utilizing computed tomography**

R. W. Bassett, A. O. Browne, B. F. Morrey and K. N. An — 405 — **Glenohumeral muscle force and moment mechanics in a position of shoulder instability**

D. Zinemanas and A. Nir — 417 — **Surface viscoelastic effects in cell cleavage**

D. A. Chakkalakal, L. Lippiello, R. F. Wilson, R. Shindell and J. F. Connolly — 425 — **Mineral and matrix contributions to rigidity in fracture healing**

R. Maroński — 435 — **On optimal running downhill on skis**

J. L. van Leeuwen, L. A. W. M. Speth and H. A. M. Daanen — 441 — **Shock absorption of below-knee prostheses: a comparison between the SACH and the Multiflex foot**

P. R. Greene and M. A. Monheit — 447 — **Optimal geometry for oval sprint tracks**

A.-L. Osvalder, P. Neumann, P. Lövsund and A. Nordwall — 453 — **Ultimate strength of the lumbar spine in flexion—an *in vitro* study**

C. C. M. Rindt, A. A. van Steenhoven, J. D. Janssen, R. S. Reneman and A. Segal — 461 — **A numerical analysis of steady flow in a three-dimensional model of the carotid artery bifurcation**

T. M. G. J. Van Eijden, P. Brugman, W. A. Weijs and J. Oosting — 475 **Coactivation of jaw muscles: recruitment order and level as a function of bite force direction and magnitude**

D. Hawkins and M. L. Hull — 487 **A method for determining lower extremity muscle–tendon lengths during flexion/extension movements**

Technical Notes

S. G. Rugg, R. J. Gregor, B. R. Mandelbaum and L. Chiu — 495 ***In vivo* moment arm calculations at the ankle using magnetic resonance imaging (MRI)**

P. O. Riley, R. W. Mann and W. A. Hodge — 503 **Modelling of the biomechanics of posture and balance**

Letters to the Editor

J. Duros — 507 **Comment on 'Analysis of flow and vascular resistance in a model of the circle of Willis' by B. Hillen, B. A. H. Drinkenburg, H. W. Hoogstraten and L. Post**

B. Hillen, B. A. H. Drinkenburg, H. W. Hoogstraten and L. Post — 508 **Authors' response**

Book Review

R. A. Brand — 509 ***Structure, Function, and Adaptation of Compact Bone*, by R. B. Martin and D. B. Burr**

Announcement — 511 **International Lung Sounds Association Annual Meeting**

Volume 23 Number 6

V. K. Sud and G. S. Sekhon — 513 **Steady flow of a viscous fluid through a network of tubes with applications to the human arterial system**

P. E. Martin and P. R. Cavanagh — 529 **Segment interactions within the swing leg during unloaded and loaded running**

T. Karino, M. Motomiya and H. L. Goldsmith — 537 **Flow patterns at the major T-junctions of the dog descending aorta**

BM 23:12-H

C. H. Turner, S. C. Cowin, Jae Young Rho, R. B. Ashman and J. C. Rice — 549 — **The fabric dependence of the orthotropic elastic constants of cancellous bone**

Hsing-Wen Sung, E. F. Philpot, N. C. Nanda and A. P. Yoganathan — 563 — **Axial flow velocity patterns in a pulmonary artery model with varying degrees of valvular pulmonic stenosis: pulsatile *in vitro* studies**

M. W. Carson and M. R. Roach — 579 — **The strength of the aortic media and its role in the propagation of aortic dissection**

I. A. F. Stokes and J. P. Laible — 589 — **Three-dimensional osseo-ligamentous model of the thorax representing initiation of scoliosis by asymmetric growth**

B. B. Lieber and D. P. Giddens — 597 — **Post-stenotic core flow behavior in pulsatile flow and its effects on wall shear stress**

H. Bot, J. Verburg, B. J. Delemarre and J. Strackee — 607 — **Determinants of the occurrence of vortex rings in the left ventricle during diastole**

Technical Note

A. L. Bell, D. R. Pedersen and R. A. Brand — 617 — **A comparison of the accuracy of several hip center location prediction methods**

Letter to the Editor

R. M. Aspden — 623 — **The effect of boundary conditions on the results of mechanical tests**

Book Review — 625 — ***Practical Color Atlas of Sectional Anatomy*, by E. A. Lyons**

Announcement — 627 — **Twelfth Annual International Conference of the IEEE Engineering in Medicine and Biology Society**

Volume 23 Number 7

S. F. C. Stewart and D. J. Lyman — 629 — **Predicting the compliance of small diameter vascular grafts from uniaxial tensile tests**

J. M. Fouke, S. Sugg and A. D. Wolin — 639 — **A model of muscular control of upper airway geometry**

S. I. Barry and G. K. Aldis — 647 — **Comparison of models for flow induced deformation of soft biological tissue**

E. P. Salathé Jr, G. A. Arangio and E. P. Salathé	655	**The foot as a shock absorber**
N. Guzelsu and R. L. Regimbal	661	**The origin of electrokinetic potentials in bone tissue: the organic phase**
N. Guzelsu and W. R. Walsh	673	**Streaming potential of intact wet bone**
M. L. Hull, A. Beard and H. Varma	687	**Goniometric measurement of hip motion in cycling while standing**
Technical Note M. F. Bobbert and H. C. Schamhardt	705	**Accuracy of determining the point of force application with piezoelectric force plates**
Abstracts	711	**Thirteenth Annual Meeting of the American Society of Biomechanics**
Announcement	743	**International Symposium on Three-dimensional Analysis of Human Movement**

Volume 23 Number 8

J. M. Pereira, J. M. Mansour and B. R. Davis	745	**Analysis of shear wave propagation in skin; application to an experimental procedure**
X. Huang, M. M. Black, I. C. Howard and E. A. Patterson	753	**A two-dimensional finite element analysis of a bioprosthetic heart valve**
A. Ascenzi, P. Baschieri and A. Benvenuti	763	**The bending properties of single osteons**
M. M. Pradas and R. D. Calleja	773	**Nonlinear viscoelastic behaviour of the flexor tendon of the human hand**
S. S. Hasan, M. J. Lichtenstein and R. G. Shiavi	783	**Effect of loss of balance on bio-mechanics platform measures of sway: influence of stance and a method for adjustment**
F. Bardati and G. Gerosa	791	**On the solution of the non-linear bio-heat equation**
E. Alici, O. Z. Alku and S. Dost	799	**Prostheses designed for vertebral body replacement**

H. Huber-Betzer, T. D. Brown and C. Mattheck — 811 **Some effects of global joint morphology on local stress aberrations near imprecisely reduced intra-articular fractures**

S. S. Margulies, L. E. Thibault and T. A. Gennarelli — 823 **Physical model simulations of brain injury in the primate**

J. D. Currey — 837 **Physical characteristics affecting the tensile failure properties of compact bone**

H. Schima, S. Tsangaris, P. Zilla, M. Kadletz and E. Wolner — 845 **Mechanical simulation of shear stress on the walls of peripheral arteries**

Technical Notes

D. J. Sharp, K. E. Tanner and W. Bonfield — 853 **Measurement of the density of trabecular bone**

A. Th. M. Willemsen, J. A. van Alsté and H. B. K. Boom — 859 **Real-time gait assessment utilizing a new way of accelerometry**

Volume 23 Number 9

Survey Article

G. J. van Ingen Schenau and P. R. Cavanagh — 865 **Power equations in endurance sports**

E. Reithmeier and W. Plitz — 883 **A theoretical and numerical approach to optimal positioning of the patellar surface replacement in a total knee endoprosthesis**

T. D. Brown, D. R. Pedersen, M. L. Gray, R. A. Brand and C. T. Rubin — 893 **Toward an identification of mechanical parameters initiating periosteal remodeling: a combined experimental and analytic approach**

O. D. Schipplein, J. H. Trafimow, G. B. J. Andersson and T. P. Andriacchi — 907 **Relationship between moments at the L5/S1 level, hip and knee joint when lifting**

R. P. Kusy and J. Q. Whitley — 913 **Effects of surface roughness on the coefficients of friction in model orthodontic systems**

H. U. Motriuk and B. M. Nigg — 927 **A technique for normalizing centre of pressure paths**

M. Areblad, B. M. Nigg, J. Ekstrand, K. O. Olsson and H. Ekström — 933 **Three-dimensional measurement of rearfoot motion during running**

Technical Notes

R. B. Ashman and J. Y. Rho 941 **Use of a transmission ultrasonic technique for the *in vitro* evaluation of bone ingrowth**

W. S. Erdmann and T. Gos 945 **Density of trunk tissues of young and medium age people**

R. N. Hinrichs 949 **Adjustments to the segment center of mass proportions of Clauser *et al.* (1969)**

Volume 23 Number 10

T. Kardel 953 **Niels Stensen's geometrical theory of muscle contraction (1667): a reappraisal**

R. S. Lakes, S. Nakamura, J. C. Behiri and W. Bonfield 967 **Fracture mechanics of bone with short cracks**

U. P. Wyss, I. McBride, L. Murphy, T. D. V. Cooke and S. J. Olney 977 **Joint reaction forces at the first MTP joint in a normal elderly population**

S. A. Berceli, D. P. Showalter, R. A. Sheppeck, W. A. Mandarino and H. S. Borovetz 985 **Biomechanics of the venous wall under simulated arterial conditions**

H. Weinans, R. Huiskes and H. J. Grootenboer 991 **Trends of mechanical consequences and modeling of a fibrous membrane around femoral hip prostheses**

K. L. Markolf, M. S. Shapiro, B. R. Mandelbaum and L. Teurlings 1001 **Wrist loading patterns during pommel horse exercises**

K. N. An, S. Himeno, H. Tsumura, T. Kawai and E. Y. S. Chao 1013 **Pressure distribution on articular surfaces: application to joint stability evaluation**

R. B. Martin 1021 **Effects of simulated weightlessness on bone properties in rats**

M. Nazemi, C. Kleinstreuer and J. P. Archie Jr 1031 **Pulsatile two-dimensional flow and plaque formation in a carotid artery bifurcation**

M. Mungiole and P. E. Martin 1039 **Estimating segment inertial properties: comparison of magnetic resonance imaging with existing methods**

B. B. Lieber 1047 **The decomposition of apparent stresses in disturbed pulsatile flow in the presence of large scale organized structures**

M. Eck, J. Hoschek and U. Weber — 1061 — **Three-dimensional determination of an oblique osteotomy in the hip by mathematical optimization fulfilling some anatomical demands**

Y. Yoshihuku and W. Herzog — 1069 — **Optimal design parameters of the bicycle–rider system for maximal muscle power output**

Letters to the Editor

D. Adler — 1081 — **The importance of internal load in contractile models of muscles**

R. N. Stiles and D. W. Hahs — 1082 — **Authors' response**

T. R. Oxland and M. M. Panjabi — 1083 — **Comment on 'Stiffness and strain energy criteria to evaluate the threshold of injury to an intervertebral joint' by N. Yoganandan, G. Ray, F. A. Pintar, J. B. Mycklebust and A. Sances Jr**

N. Yoganandan, G. Ray, F. A. Pintar and A. Sances Jr — 1084 — **Authors' response**

Announcements

1085 — **Third International Symposium on Computer Simulation in Biomechanics**

Fourth European Congress on Research in Rehabilitation

Volume 23 Number 11

S. I. Singh and L. Shila Devi — 1087 — **A study on large radial motion of arteries *in vivo***

N. E. Waters — 1093 — **The mechanics of asymmetric retraction loops used in fixed appliance therapy**

K. Choi, J. L. Kuhn, M. J. Ciarelli and S. A. Goldstein — 1103 — **The elastic moduli of human subchondral, trabecular, and cortical bone tissue and the size-dependency of cortical bone modulus**

D. M. K. S. Kaulesar Sukul, E. J. Johannes, R. K. Marti and P. J. Klopper — 1115 — **Biomechanical measurements on scaphoid bone screws in an experimental model**

A. Kralj, R. J. Jaeger and M. Munih — 1123 — **Analysis of standing up and sitting down in humans: definitions and normative data presentation**

R. N. McCarthy, L. B. Jeffcott and R. N. McCartney — 1139 — **Ultrasound speed in equine cortical bone: effects of orientation, density, porosity and temperature**

M. H. Holmes and V. C. Mow 1145 **The nonlinear characteristics of soft gels and hydrated connective tissues in ultrafiltration**

B. Hojjatie and K. J. Anusavice 1157 **Three-dimensional finite element analysis of glass–ceramic dental crowns**

F. Linde, B. Pongsoipetch, L. H. Frich and I. Hvid 1167 **Three-axial strain controlled testing applied to bone specimens from the proximal tibial epiphysis**

Technical Note

F. Katsamanis and D. D. Raftopoulos 1173 **Determination of mechanical properties of human femoral cortical bone by the Hopkinson bar stress technique**

Volume 23 Number 12

M. G. Pandy, F. E. Zajac, E. Sim and W. S. Levine 1185 **An optimal control model for maximum-height human jumping**

T. E. Southard, K. A. Southard and R. N. Stiles 1199 **Factors influencing the anterior component of occlusal force**

G. R. Pennock and K. J. Clark 1209 **An anatomy-based coordinate system for the description of the kinematic displacements in the human knee**

L. Blankevoort, R. Huiskes and A. de Lange 1219 **Helical axes of passive knee joint motions**

H. Nygaard, M. Giersiepen, J. M. Hasenkam, D. Westphal, P. K. Paulsen and H. Reul 1231 **Estimation of turbulent shear stresses in pulsatile flow immediately downstream of two artificial aortic valves *in vitro***

J. Jurvelin, I. Kiviranta, A.-M. Säämänen, M. Tammi and H. J. Helminen 1239 **Indentation stiffness of young canine knee articular cartilage—influence of strenuous joint loading**

C. W. Spoor, J. L. van Leeuwen, C. G. M. Meskers, A. F. Titulaer and A. Huson 1247 **Estimation of instantaneous moment arms of lower-leg muscles**

J. A. Hipp, B. C. Edgerton, K.-N. An and W. C. Hayes 1261 **Structural consequences of transcortical holes in long bones loaded in torsion**

Technical Notes

K.-N. An, L. Berglund, W. P. Cooney, E. Y. S. Chao and N. Kovacevic 1269 **Direct *in vivo* tendon force measurement system**

H. J. Woltring — 1273 **Estimation of the trajectory of the instantaneous centre of rotation in planar biokinematics**

J. Bobet and R. W. Norman — 1275 **Least-squares identification of the dynamic relation between the electromyogram and joint moment**

L. Romdhane, L. Chidgey, G. Miller and P. Dell — 1277 **Experimental investigation of the scaphoid strain during wrist motion**

Announcements

1285 **Twenty-second Midwestern Mechanics Conference**

1285 **Eighteenth International Congress of Theoretical and Applied Mechanics**

1286 **Call for Proposals to Host IUTAM Symposia in 1994 or 1995**

Volume Contents and Author Index to Volume 23 — i

Volume 23 Supplement 1

PROCEEDINGS OF THE XII CONGRESS, INTERNATIONAL SOCIETY OF BIOMECHANICS

Preface
R. J. Gregor and R. F. Zernicke — 1 **XII Congress, International Society of Biomechanics**

B. M. Nigg and M. Bobbert — 3 **On the potential of various approaches in load analysis to reduce the frequency of sports injuries**

J. Bobet, R. B. Stein and M. N. Oğuztöreli — 13 **Mechanisms relating force and high-frequency stiffness in skeletal muscle**

P. V. Komi — 23 **Relevance of *in vivo* force measurements to human biomechanics**

V. M. Zatsiorsky and A. V. Aktov — 35 **Biomechanics of highly precise movements: the aiming process in air rifle shooting**

C. T. Rubin, K. J. McLeod and S. D. Bain — 43 **Functional strains and cortical bone adaptation: epigenetic assurance of skeletal integrity**

Keynote Symposium: Locomotion
M. Kaneko — 57 **Mechanics and energetics in running with special reference to efficiency**

T. A. McMahon and G. C. Cheng 65 **The mechanics of running: how does stiffness couple with speed?**

M. H. Raibert 79 **Trotting, pacing and bounding by a quadruped robot**

T. P. Andriacchi 99 **Dynamics of pathological motion: applied to the anterior cruciate deficient knee**